CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

ORDER NO. R4-2006-XXXX

WASTE DISCHARGE REQUIREMENTS
FOR THE
ARMY CORP OF ENGINEERS
TECHNOLOGY DEMONSTRATION FOR
PERCHLORATE IN SHALLOW GROUNDWATER AT AREA 11 OF THE
FORMER WHITTAKER-BERMITE SITE

(FILE NO. 06-114)

The California Regional Water Quality Control Board, Los Angeles Region, (hereafter Regional Board) herein finds that:

TENTATIVE

1. The Army Corp of Engineers (hereafter Discharger) has filed a Report of Waste Discharge and applied for Waste Discharge Requirements (WDR) to use an amendment consisting of citric acid and diammonium phosphate solutions to bioremediate perchlorate in shallow groundwater through reductive decomposition to environmentally acceptable compounds at the Technology Demonstration site in Area 11. The Department of Toxic Substances Control (DTSC) is the lead agency for the site. The Regional Board is providing the WDR for the technology demonstration.

2. The Site encompasses approximately 4,000 square feet within the former Whittaker-Bermite property. The Whittaker-Bermite property consists of 996 acres of land and is located at 22116 Soledad Canyon Road, Santa Clarita, California, in Assessor's Parcel Number 2836-012-011 (Latitude 34° 24' 46.96" North, Longitude 118° 31'09.15" West, see Figure 1). The site is located in an undeveloped area. The property was first subdivided in 1912. From 1934 to 1936, the Bermite facility was used to manufacture dynamite under the ownership of the L.A. Powder Company. The Halifax Explosives Company manufactured fireworks there from 1936 to 1942. In 1939, Golden State Fireworks also manufactured fireworks at the facility. In 1942, E.P. Halliburton manufactured oil field explosives there. Production by the Bermite Powder Company occurred from 1942 to 1967, and included flares, explosives, detonators, fuses, boosters, coated magnesium, and stabilized red phosphorus. In 1967, Whittaker took ownership of the property. Whittaker manufactured 20-millimeter (mm) and 30-mm cannon shells, detonators, fuses, boosters, flares, signal cartridges, tracers, pyrophoric pellets, rocket motors, torpedo gas generators, oil filed explosives, JATO boosters, and artillery and missile main explosive charges. The current owner Santa Clarita LLC plans to redevelop the property and build more than 2900 dwelling units and associated retail, office, and commercial buildings.

3. Environmental investigations began at the site in 1981. Soil and groundwater contamination are widespread at the site. The primary contaminants are perchlorate, perchloroethene (PCE), and trichloroethene (TCE). The contamination is associated with open burn areas, subgrade explosive detonation areas, chemical storage and handling areas, manufacturing areas, waste pipelines, and clarifiers.

4. Shallow groundwater beneath the Site is first encountered at approximately 25 to 30 feet below ground surface, this is in alluvial material, resting on bedrock. Bedrock occurs approximately 150 feet below grade. The shallow alluvial aquifer is comprised primarily of sand and gravel. The alluvium has relatively high hydraulic conductivity and the underlying bedrock has relatively low hydraulic conductivity.

5. The Discharger has conducted a comprehensive site-wide soil and groundwater investigation, with numerous soil borings and monitoring wells. The demonstration area represents a very small portion of the site (less that 0.1-acre of 996 acres). There are 18 monitoring wells in the 4,000 square feet of the demonstration area (Figures 2 and 3). Groundwater sampling began at the site in the early 1990s.

6. In the demonstration area the primary contaminant detected in soil and groundwater is perchlorate. In the demonstration area the concentration of perchlorate in groundwater ranges from 240 micrograms per liter (µg/L) to 670 µg/L. Recent perchlorate and other analyte data for groundwater are shown on Figure 4.

7. The Discharger has implemented numerous soil remedial activities at the 996-acre facility under the direction of the DTSC.

8. There are four water supply wells within approximately 1 mile of the Site. Several of the wells have been impacted with perchlorate from the site. The technology being demonstrated under this WDR is a technology that may be used to help restore the aquifer.

9. The Discharger proposes to conduct a perchlorate in groundwater remediation technology demonstration. Prior to the technology demonstration, a 6-week, sodium bromide tracer test will be conducted. The tracer test will involve injection of approximately 702,000 gallons of 20 milligram per liter (mg/L) sodium bromide solution into the shallow alluvial aquifer. An 18-week technology demonstration will follow the tracer test. The technology demonstration involves the recirculation of groundwater and the injection of amendments, including citric acid (citrate) and nutrients (i.e., diammonium phosphate). The amendments will be added to groundwater extracted from two extraction wells (EW-1 and EW-2) and re-injected into a single, central, injection well (IW-1). These wells are shown on Figure 3. A conceptual cross section of the process is provided as Figure 5. The extraction and injection wells will be screened from approximately 27 feet below grade (bg) to approximately 107 feet bg, with 10 feet of blank casing backed by well seal from 67 bg to 77 feet bg. Groundwater occurs approximately 28 feet bg. The design extraction rates for each of the extraction wells is 5.8 gallons per minute (gpm) and the design injection rate is 11.6 gpm. During the first 6 weeks of the demonstration, approximately 116,928 gallons of 1,600 mg/L citric acid solution will be injected into groundwater. An additional 116,928 gallons of 1,600 mg/L citric acid solution will be injected during the subsequent 12 weeks. The citric acid solution will be injected in three pulses per day (maximum). Each pulse will be 2 hours long. The design involves extraction and injection wells to be operated in a cycled-manner, with 7 days "on" and 14 days "off". Approximately 106 gallons of diammonium phosphate will be injected over the 18 weeks. A chlorine dioxide solution may be used in the injection well from time to time to prevent biofouling.

10. The contingency plan, should indications of offsite migration occur, is the operation of the extraction wells at maximum pumping rates, without injection, and the containment of any injected material.

11. The technology demonstration is being conducted as proposed in a February 9, 2006, document titled, *Technology Demonstration Plan-Revised In Situ Bioremediation of Perchlorate in Area 11 Alluvial Groundwater* (Remedial Action Plan (RAP)) as approved by the DTSC in a letter dated April 3, 2006. The Regional Board received the RAP on February 10, 2006, and following discussions with various parties involved with the project, concurred with DTSC's approval in a letter dated June 30, 2006.

12. The Discharger submitted a "Form 200" Report of Waste Discharge (dated May 17, 2006), to the Regional Board for injection of citric acid and diammonium phosphate solution into groundwater at the Site for use in in-situ bioremediation technology demonstration to address perchlorate in the groundwater. The Form 200 was received on May 18, 2006. Supplemental information on the revised location of an upgradient monitoring well was received on June 2, 2006, and the Form 200 was deemed complete by the Regional Board in a letter dated June 22, 2006.

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13. The RAP presents proposed procedures for monitoring the technology demonstration. Evaluation of the injection volume and concentrations, and the frequency of injection will be adjusted based on the results of field monitoring. Groundwater conditions will be monitored during the operation to evaluate the efficiency of the injection.

14. Groundwater will be treated using enhanced in-situ bioremediation as presented in RAP. An amendment solution consisting of citric acid and diammonium phosphate will be injected into an areas within Area 11, where it will promote biological reduction of perchlorate. The bioremediation area will be under hydraulic control. The injection well will be between two extraction wells, and it is anticipated that all injected material will be captured by the extraction wells. The contingency plan, should indications of offsite migration occur, is the installation of a hydraulic containment system. The rate of groundwater flow within and down gradient of the technology demonstration area allows for sufficient time to complete design, installation, and implementation of a hydraulic containment system if necessary.

15. Any injection of a solution into the groundwater is a discharge of waste as defined by the California Water Code. However, the discharge of citric acid and diammonium phosphate solution is intended to provide effective remediation of perchlorate-impacted groundwater and is expected to significantly reduce the anticipated site cleanup time as compared to pump-and-treat technology.

16. The application of citric acid and diammonium phosphate amendments to groundwater may result in temporary adverse impacts to groundwater quality, but impacts that may result will be localized, and of short-term duration, and will not impact any existing or prospective uses of groundwater.

17. The Regional Board adopted a revised Water Quality Control Plan for the Los Angeles Region on June 13, 1994. The Plan contains beneficial uses and water quality objectives for the Central Groundwater Basin. The requirements contained in this Order, as they are met, will be in conformance with the goals of the Plan.

18. The beneficial uses for the groundwater in the Santa Clara – Bouquet and San Francisquito portion of the Eastern Santa Clara River Groundwater Basin as municipal and domestic supply, industrial process supply, industrial service supply, and agricultural supply.

19. The permitted discharge is consistent with the anti-degradation provisions of State Water Resources Control Board Resolution No. 68-16 (Anti-degradation Policy). The discharge may result in some localized temporary exceedances of background concentrations total organic carbon total organic carbon, chloride, iron, manganese, phosphorus, arsenic, and total dissolved solids (TDS), and certain microorganisms. However, after the injection of amendments, these parameters are not anticipated to exceed the primary or secondary standards to the extent that these parameters do not already exceed the respective standard. Moreover, any parameter change resulting from the discharge:

    a. Will be consistent with maximum benefit to the people of the State.
    b. Will not unreasonably affect present and anticipated beneficial uses of such water, and
    c. Will not result in water quality less than that prescribed in the Water Quality Control Plan for Central Groundwater Basin.

20. The Regional Board has assumed lead agency role for this project under the California Environmental Quality Act (Public Resources Code section 21000 et seq.) and has conducted an Initial Study in accordance with section 15063 of the "State CEQA Guidelines" at California Code of Regulations, title 14, section 15000 et seq. Based upon the Initial Study, the Regional Board prepared a Mitigated Negative Declaration that the project, as mitigated, will not have a significant adverse effect on the environment.

TENTATIVE

21. The Regional Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for this discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written comments and recommendations. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge and to the tentative requirements.

IT IS HEREBY ORDERED that the Army Corp of Engineers, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted there under, shall comply with the following:

TENTATIVE

A. Discharge Limits

1. The Discharger shall not cause the groundwater outside of the remediation area to exceed background concentrations of chloride and TDS established prior to start of remediation.

2. The discharge of sodium bromide, citric acid, diammonium phosphate solution, or chlorine dioxide into the groundwater shall be only performed while this Order is in force.

3. During this remediation, the injected volume of 20 mg/L sodium bromide tracer solution shall not exceed 750,000 gallons, the injected volume of 1,600 mg/L citric acid solution shall not exceed 250,000 gallons, the injected volume of diammonium phosphate shall not exceed 500 gallons, and the injected volume of chlorine dioxide shall not exceed 150 gallons at the Site, unless approved by the Executive Officer.

4. Discharge duration shall not exceed more than 2 years, unless approved by the Executive Officer.

5. The amendment solution shall be limited to potable water, extracted groundwater, amendments specified in the approved Workplan and Form 200, Report of Waste Discharge.

B. Discharge Specifications

1. The Discharger shall stop further addition of amendments to the groundwater if citric acid, diammonium phosphate, sodium bromide, or chlorine dioxide solutions are observed to be migrating off-site. After this control measure has been implemented the remaining amendments in the groundwater will naturally break down, effectively removing the food source and allowing the groundwater system to return to natural conditions.

2. The Discharger shall not cause citric acid, diammonium phosphate, sodium bromide, or chlorine dioxide solutions, and the by-products of the bioremediation process to migrate outside of the treatment area established by the Discharger and approved by the Executive Officer.

3. The discharge of sodium bromide, citric acid, diammonium phosphate, sodium bromide, or chlorine dioxide solutions or any by-products into any surface water or surface water drainage course is prohibited.

4. The Discharger shall not cause the groundwater to contain taste or odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses outside the treatment area.

5. The Discharger shall not cause the groundwater to contain concentrations of chemical substances or its by-products, including if citric acid, diammonium phosphate, sodium bromide, or chlorine dioxide solutions in amounts that adversely affect any designated beneficial use as a result of the injection of solution.

6. The Discharger shall implement hydraulic control to prevent off-site migration if necessary.

C. **Provisions**:

1. This Order includes the attached "Standard Provisions Applicable to Waste Discharge Requirements," which are incorporated herein by reference. If there is any conflict between provisions stated herein before and the attached "Standard Provisions," those provisions stated herein shall prevail.

2. Discharge of wastes to any point other than specifically described in this Order is prohibited and constitutes a violation thereof.

3. In the event of any change in name, ownership, or control of the Site, the Discharger shall notify this Regional Board in writing and shall notify any succeeding owner or operator of the existence of this Order by a letter, a copy of which shall be forwarded to this Regional Board.

4. A copy of these requirements shall be maintained at an on-site office and be available at all times to operating personnel.

5. In accordance with section 13260 of the Water Code, the Discharger shall file a report of any material change or proposed change in the character, location or volume of discharge.

6. The Discharger shall notify Regional Board immediately by telephone of any adverse condition resulting from this discharge or from operations producing this waste discharge, such notifications to be affirmed in writing within one week from the date of such occurrence.

7. This Regional Board considers the property operator and owner to have continuing responsibility of correcting any problem that may arise in the future as a result of this discharge.

8. All work must be performed by or under the direction of a registered civil engineer, professional geologist, or certified engineering geologist. A statement is required in all technical reports that the registered professional in direct responsible charge actually supervised or personally conducted all the work associated with the project.

9. The use of sodium bromide, citric acid, diammonium phosphate, or chlorine dioxide solutions shall not cause a condition of pollution or nuisance as defined by California Water Code, section 13050.

10. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as specified in the attached Monitoring and Reporting Program No. CI-XXXX. Violations of any conditions may result in enforcement action, including Regional Board or Court Order requiring corrective action or imposition of civil monetary liability, or revision, or rescission of the Order.

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11. This Order does not exempt the Discharger from compliance with any other laws, regulations, or ordinances, which may be applicable. This Order does not legalize the waste treatment Site, and leaves unaffected any further restraints on the Site that may be contained in other statutes or required by other agencies.

12. The Discharger shall cleanup and abate the effects of injecting amendment solution as specified in the WDR, including extraction of any by-products which adversely affect beneficial uses, and shall provide an alternate water supply source for municipal, domestic or other water use wells that become contaminated in exceedance of water quality objectives as a result of using the solution.

13. In accordance with section 13263 of the California Water Code, these requirements are subject to periodic review and revision by this Regional Board.

14. After notice and opportunity for a hearing, this Order may be terminated or modified for cause including, but not limited to:

    a. Violation of any term or condition contained in this Order.
    b. Obtaining this Order by misrepresentation, or failure to disclose all relevant facts.
    c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized discharge.

15. The Regional Board, through its Executive Officer, will modify the Monitoring and Reporting Program, as necessary. The California Environmental Quality Act (CEQA) initial study and associated public comment were conducted once as part of the Waste Discharge Requirement (WDR) permit application process and will not be required for the expansion or modification of this remediation program.

D. Expiration Date

This Order expires on October 12, 2011.

The Discharger must file a Report of Waste Discharge in accordance with title 27, California Code of Regulations, not later than 180 days in advance of such date as application for issuance of new waste discharge requirements.

I, Jonathan Bishop, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Los Angeles Region on October 12, 2006.

_____

Jonathan Bishop
Executive Officer

TENTATIVE

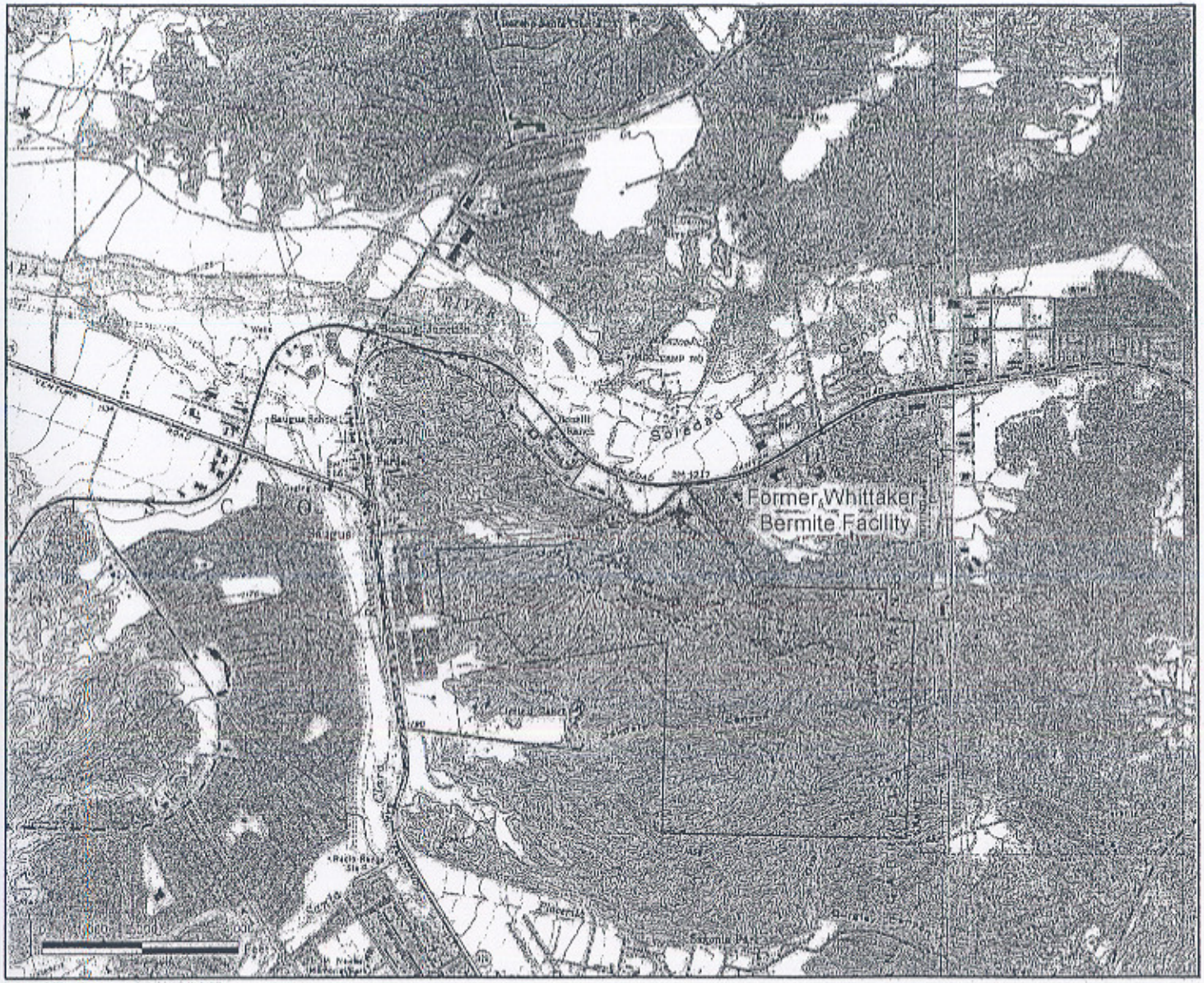

Figure 1

Site Location Map

Former Whittaker Corporation
Bermite Facility
Santa Clarita, California

Note: Topographic image downloaded from TerraServer

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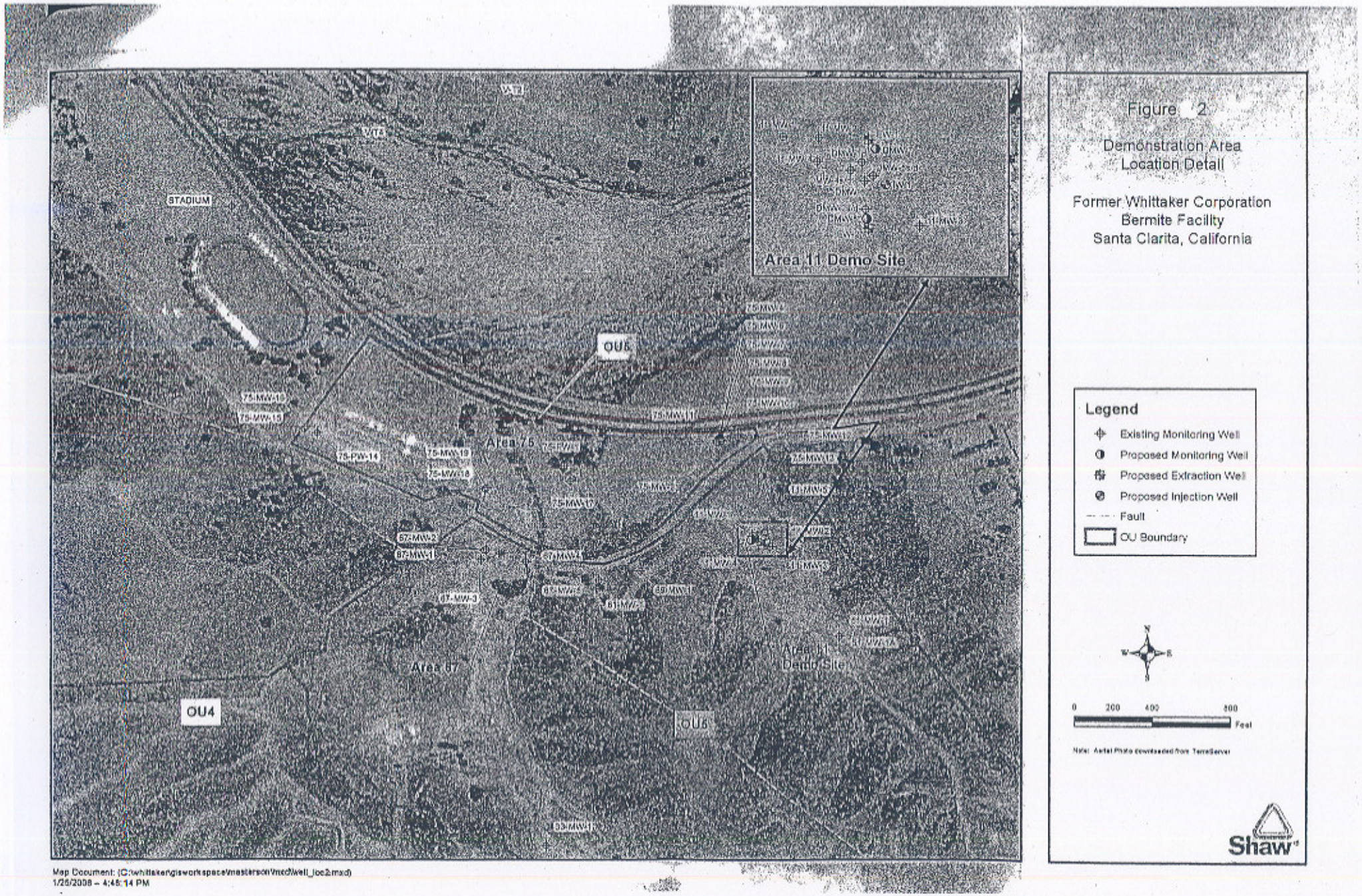

Figure 2

Demonstration Area
Location Detail

Former Whittaker Corporation
Bermite Facility
Santa Clarita, California

Legend

- Existing Monitoring Well
- Proposed Monitoring Well
- Proposed Extraction Well
- Proposed Injection Well
- Fault
- OU Boundary

N
W E
S

0 200 400 800
Feet

Note: Aerial Photo downloaded from TerraServer

Shaw

Map Document: (C:\whittaker\gisworkspace\mastersonVmxd\well_loc2.mxd)
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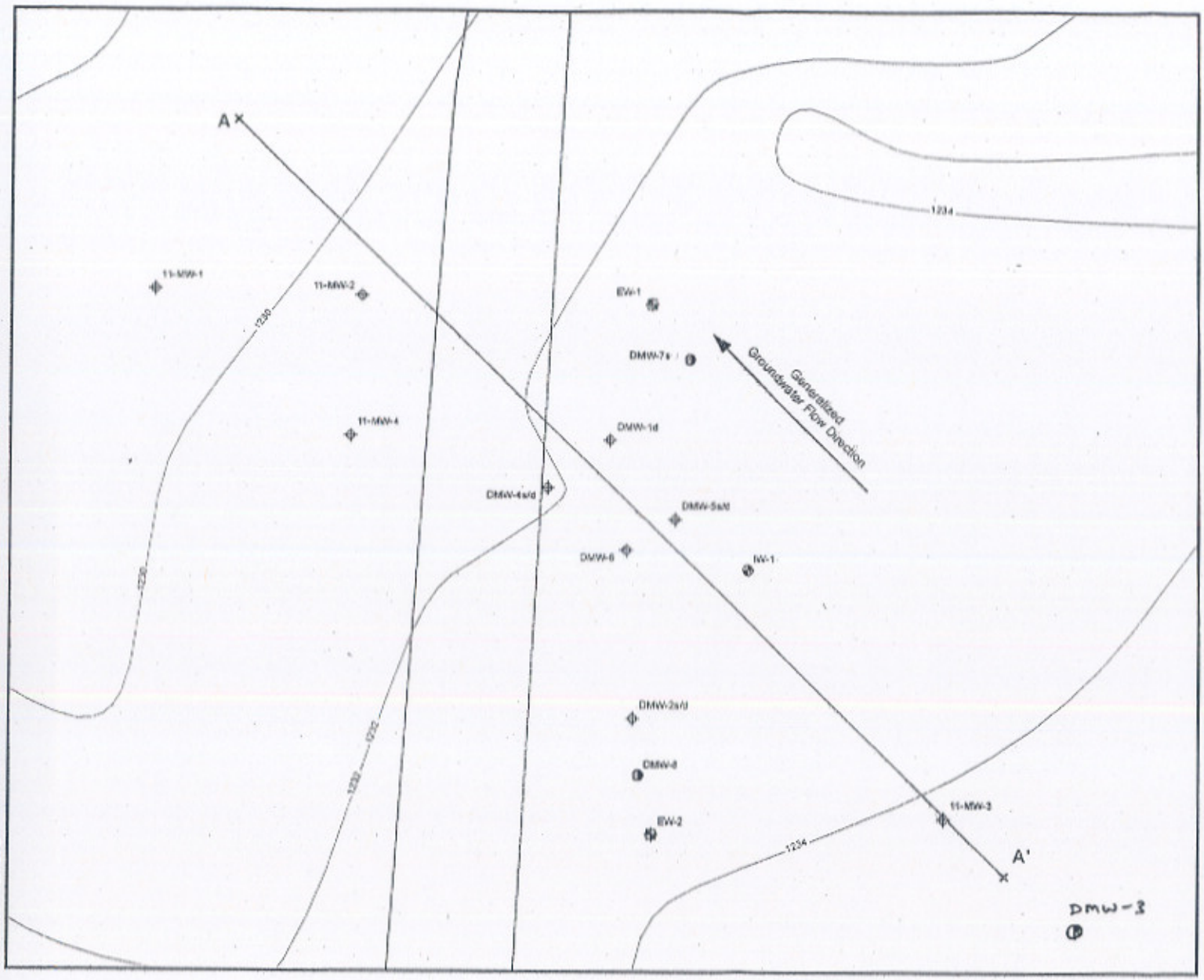

Figure 3

Demonstration Well Layout - Area 11

Former Whittaker Corporation
Bermite Facility
Santa Clarita, California

Legend

- Road
- Surface Contour (2 ft)
- Existing Monitoring Well
- Proposed Monitoring Well
- Proposed Extraction Well
- Proposed Injection Well

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0 5 10 20
Feet

Shaw®

Map Document: (C:\whittaker\gis\workspace\masterson\mxd\area 11_well_location_dec2005.mxd)
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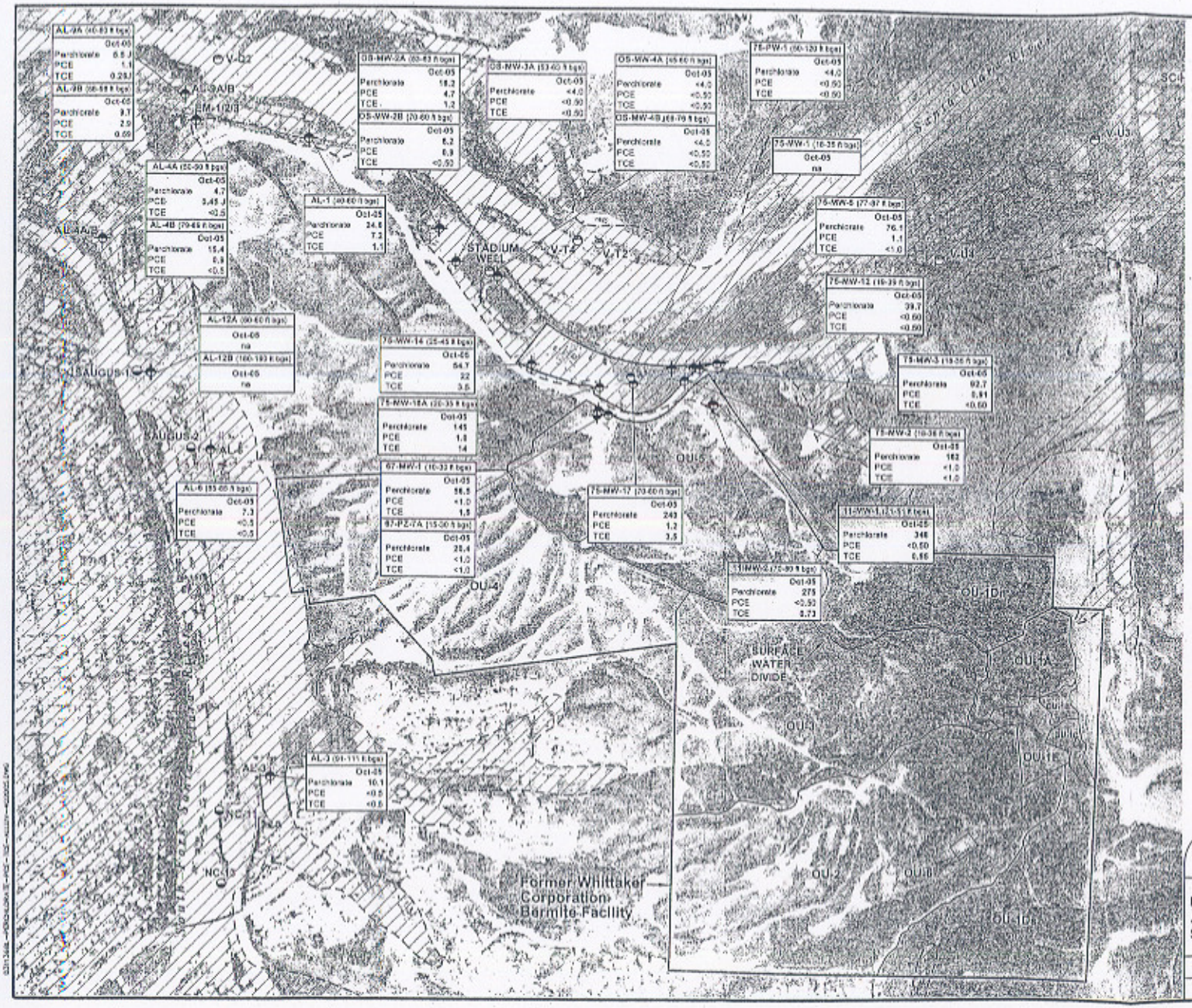
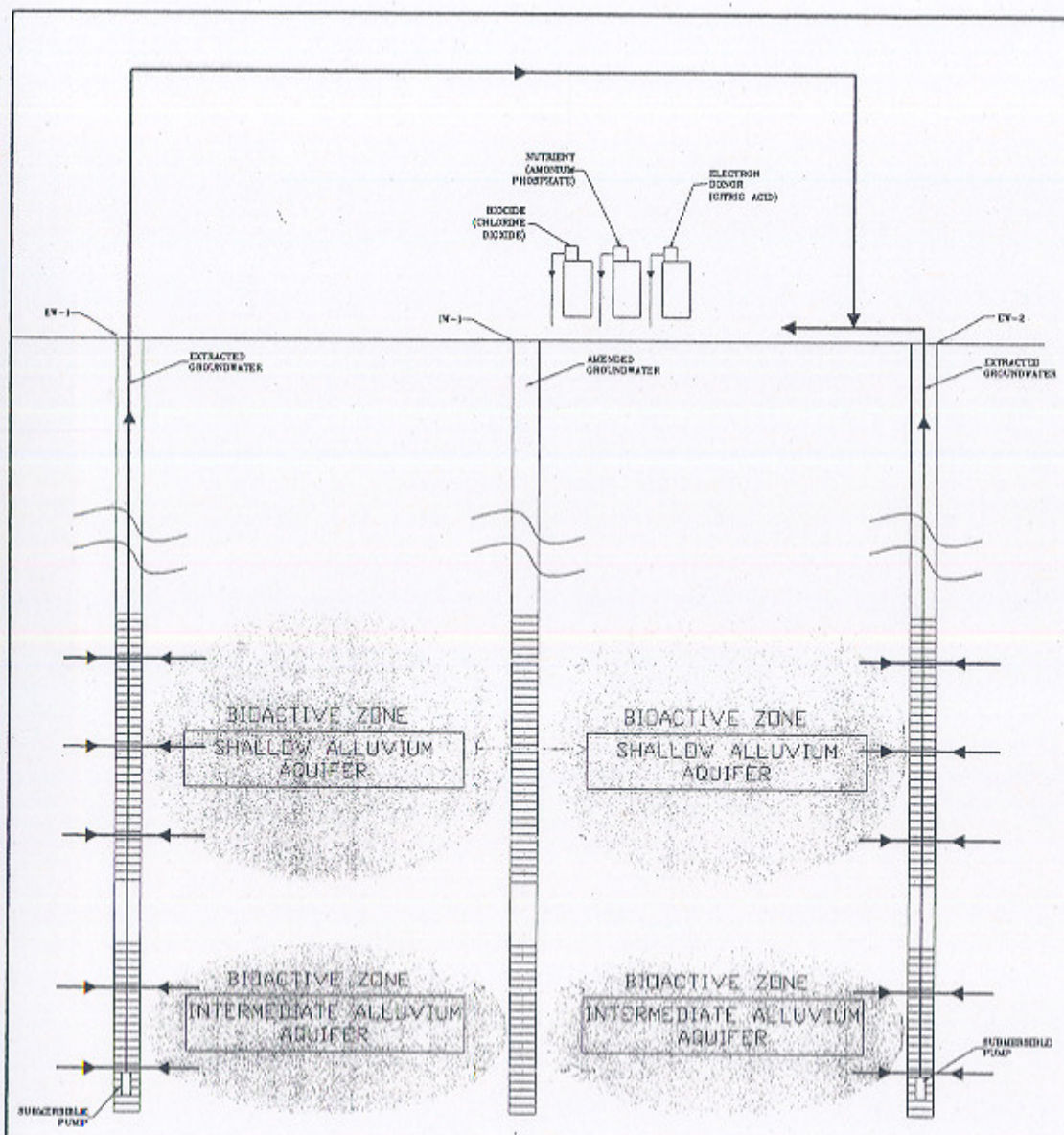


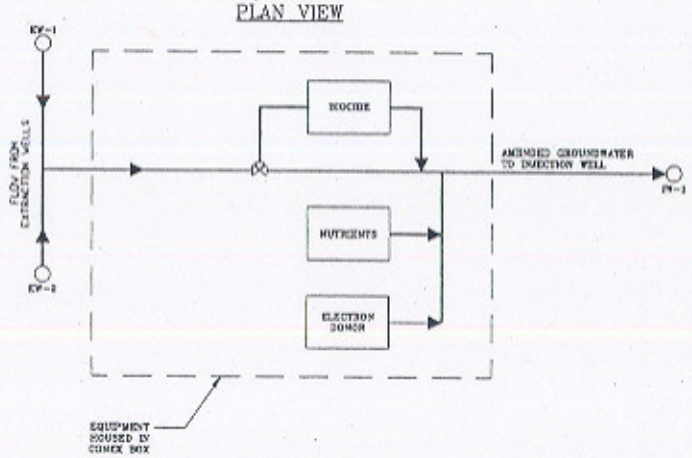
ENVIRON

Perchlorate, PCE, and TCE Concentrations - Alluvium, Fourth Quarter 2005
Santa Clarita, California

DATE	CONTRACT NUMBER	FIGURE
5/30/08	03-11368L	4
DRAFTER: RS	APPROVED:	REVISED:



EQUIPMENT
PLAN VIEW



Shaw E&I, Inc.	FORMER WHITTAKER BERMITE FACILITY SANTA CLARITA, CALIFORNIA				
	FIGURE 5 GENERALIZED PROCESS SCHEMATIC				
DESIGNED BY	BRL	01/24/08	CHECKED BY	DWB	01/31/08
DRAWN BY	DA	01/24/08	APPROVED BY	PBH	01/31/08
SIZE: B	SCALE: NTS	DRAWING NO.: 100831-B2	SHEET NO.:	REVISION NO.: 0	